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The ILLINOIS ENGINEER

ILLINOIS SOCIETY OF PROFESSIONAL ENGINEERS
INCORPORATED

Affiliated with the National Society of Professional Engineers

614 East Green Street — Champaign, Illinois

OLUME XXXIII, NO. 7 — SUMMER ISSUE — JULY, 1957

PRESIDENT'S MESSAGE

By ANDREW W. NEUREUTHER, *President*

This is the Good Old Summertime. Make the most of while it lasts.

This is the best season for construction work and all utside activities.

It is a busy season for engineers who are concerned ith outside work and whose projects are being built. This often leads to overtime work and long extra hours for the engineers.

President Neureuther

Conversely, summer is the traditional time to relax; the time for vacations; the time for recreation. With children home from school there are opportunities for family life, spending time with the children, taking trips which are educational and entertaining.

There is usually a moratorium in the affairs of organizations, and there is usually a lessening of Chapter ctivities in ISPE. The meetings are less formal. The rograms are varied and light. Attendance may be rregular. And there is a penchant for picnics.

How can these two be compatible? The busiest season f the year for engineers and the time for relaxation nd recreation? How can time possibly be found for verything?

Each engineer should examine his living and working chedule to be sure that he has a well-rounded program hat will lead to good health, happiness, sufficiency, vell-being, and the promise of a long, successful, and revarding life.

The object of life is living — not merely existing.

Each day ought to be consciously lived, and not be nerely survived under difficulties and overwork. The ensions and anxieties of modern living must not be permitted to shorten the lives of engineers, or to frustrate their productiveness and creativity. After all nen's minds work most clearly and creatively when hey are free from worry and pressure and overwork.

So plan a program for daily living which combines proper amounts of work, recreation, and rest for the greatest individual well-being. To gain genuine satisfaction one must be moderate in all things. Professional engineers ought to lead exemplary lives, for if they can't manage their own lives from day to day how can they presume to professionally advise others how to manage their affairs?

While summer is here make the most of it! And may each one have a pleasant and satisfying vacation.

VOX SECRETARII

By P. E. ROBERTS, *Executive Secretary*

Multitudinous Activity

The Executive Secretary has been engaged in legislative activity and Chapter visits during the last four weeks. Both of these activities have been reported elsewhere.

Structural Examination Questions Book

The Structural Examination Questions Book is one more step nearer completion and the time table report in the May issue is being followed.

Ballot

Your attention is particularly called to the ballot and ballot information found elsewhere in this issue. The Constitution provides that amendments to it shall receive at least 50 votes and two-thirds of those voting must vote affirmatively to be adopted. Therefore, it is of the utmost importance that each corporate member of the Society make his desires known by marking and mailing the ballot. Your cooperation is earnestly solicited and will be appreciated by your State officers.

Miscellany

Ninety-three belonging to the Society were dropped by non-payment of dues on July 1. Therefore, the help of each one who reads this is necessary if the membership total of 2,000 is to be reached during 1957 . . . The air-conditioned weather during June which has been supplied by our genial weatherman is gratefully acknowledged.

If you want your wife to pay attention to what you say, address your remarks to another woman.—*Round Table*

SUBSCRIPTION RATES

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ITEMS OF PERSONAL INTEREST

It is with mixed feelings that the news of Elmer Knight's promotion as consultant to the department is received. For a number of years now the position of Assistant Chief Highway Engineer and Elmer Knight have been synonymous. It is with regret that his illness made the move necessary, but with pleasure that he will be able to take things easier.

* * * *

Robert H. Tittle (N '54), who has been engineer of construction, has been promoted to Assistant Chief Highway Engineer, Illinois Division of Highways.

* * * *

President Andy Neuruether is riding his hobby hard this summer. He sails his Thistle class boat in the series of races that have been held on Lake Decatur. Andy writes that the anonymous definition of a hobby, "hard work you wouldn't do for a living," certainly applies to sailing.

* * * *

DuKane Chapter President Magowan led a personally conducted tour through the Division of Highways new building in Elgin as a prelude to the June 20 Chapter meeting. In the party were President Neureuther, Vice President Edwards and Executive Secretary Roberts. The group of buildings is not only functional, but of a modern design architecturally. Shaw, Metz and Dolio are to be congratulated for a very pleasing and functional layout.

* * * *

John D. Jarvis (S '43) is the new Illinois State Architect. John is a graduate of the University of Illinois, Department of Architectural Engineering, class of 1930. He won the Plym foreign scholarship, later joined Portland Cement Association as a field engineer for about ten years, and in the early forties he opened his own office in Chicago. He is a member of the American Institute of Architecture, the Illinois Society and numerous other organizations. His many friends in the Society extend their best wishes to him in his new position.

* * * *

On Wednesday, June 19, Professor Babbitt showed his Brazilian pictures to approximately 200 members and friends of the Illinois Society in Champaign. As usual, the extemporaneous talk and stories the Professor had to tell were as engaging as the pictures were beautiful. On his way from Washington he picked up a new Buick in Flint, which is fully equipped including compass and air conditioning. He spent six days in Champaign-Urbana, a similar time in Ames, Iowa and he was scheduled to arrive in Seattle to work on the Puget Sound project on July 1.

* * * *

On Tuesday, June 25, Art Thorsell was host to the Capital Chapter at the second Annual Fish Fry. Boat riding, fishing, liquid refreshments, conviviality and card games made for a very short, but highly enjoyable evening.

LEGISLATIVE ACTIVITY

The 70th General Assembly, State of Illnois, was one of the most successful in the history of the Illinois Society.

Senate Bill 396, the Architects Bill, after being amended in Committee in the Senate went through the House without amendment; however, an amendment was introduced on second reading in the House, which made it necessary for the Bill to be returned to the Senate for approval of the amendment. The Senate passed the Bill on June 25 and sent it to the Governor for signature.

Senate Bill 634 requires that the City Engineer be registered under the Illinois Professional Engineering Act. This Bill was passed by the House on June 25 and was sent to the Governor for signature. Of the two companion Bills, 635, which required that a member of the Electrical Commission be a registered engineer, and 636, which required that a member of the Zoning Commission be a registered engineer, neither received necessary support to be passed.

House Bills 352 and 353, the Bills introduced by the County Superintendents of Highways providing that monies in the motor fuel tax fund shall be used to pay salaries of County Superintendents of Highways, were tabled on June 10.

House Bill 673, the IAHE Bill on positions and salaries was recorded out of committee on June 10, but fell by the way. The Administration Bill, H. B. 1344, was on third reading in the Senate on June 25 and will undoubtedly be enacted into law by the time you read this.

House Bills 913 through 921, the series of County Surveyor Bills were at third reading in the Senate on June 25. Also, House Bills 868 through 876, which eliminate the filing of plans for certain municipal improvements prior to adoption of ordinance, were on third reading June 25. This latter series was of particular interest to the engineers in private practice. Both series of Bills should be enacted into law without difficulty.

House Bills 794, 797 and 798, increasing the annual renewal fees for Architects, Professional Engineers and Structural Engineers, and making renewal every two years instead of annually, were passed on June 25 and will undoubtedly become law because they were administration sponsored.

The Illinois Society is indebted to its legislative chairman, George Farnsworth, to Dean Collins, Ray Tilly, Arnold Lundgren, Len Crawford, Carter Jenkins, and many others for their help by attending hearings and in other ways. A special vote of thanks should go to Leo Spurling, chairman of the IEC Legislative Committee, and Walter Hanson, Secretary of IEC. Furthermore, much off the record help and advice was given by Bob Wallace and Representative Charles K. Willett.

The most reliable thing about some people is the assurance that they will be unreliable.—*P K Sideliner*

DIGEST OF JUNE, 1957, UNIVERSITY OF ILLINOIS SALARY SURVEY

In the past several years the demand for engineers has increased at such a rapid rate that universities and colleges have been faced with the problem of supplying help and information to companies who seek graduating engineers.

A year ago the University of Illinois College of Engineering set up a group of interview and conference rooms and the staff of the Associate Dean of Engineering was enlarged to do a better job for both the interviewer and the seniors. Some years ago it would have been difficult to obtain the information given in the tables below; however, through the cooperation of Associate Dean Wakeland and Mrs. Pauline Chapman, these records are made available to the members of the Illinois Society.

Most of the figures speak for themselves; however, a comparison of the salaries paid all engineers in June, 1956, $441.00, with those salaries paid in June of 1957, $481, shows that the price is still rising. Half of the 1957 graduates received salaries between $460 and $500 per month, the lower fourth from $320 to $460 and the upper quarter from $500 to $675.

Your attention is called to two very interesting items. Under the reasons given for accepting positions, salary is in fourth place and under the type of company employing these young men, over 40% went to aircraft, missile electronics, radio and TV.

Reasons Given for Accepting Position

1. Location
2. Type of work
3. Opportunity
4. Salary
5. Worked summers for company
6. Opportunity for Graduate Work
7. Company reputation
8. Type of Industry
9. Company Product
10. Security

plus 16 other reasons

Type of Company	
Aircraft and Missile	21.9%
Electronics, Radio and TV	19.7
Light Manufacturing	9.0
Public Utilities	8.6
Heavy Manufacturing	6.9
Consulting Engr., Contr., and Architect	6.4
Federal Government	6.0
Basic Metals (Steel, etc.)	6.0
Rubber	3.0
Research	2.2
All Other (none over 1.71%)	10.3

TECHNICIAN TRAINING PROGRAM OF ILLINOIS DIVISION OF HIGHWAYS

The State of Illinois Division of Highways has begun a project which will be watched with considerable interest by those who hire engineers.

In order to remove part of the pressure caused by the present shortage of engineers, a group of 200 high school graduates began a technical training course on June 17 from which they will graduate on August 31.

These young men, all high school graduates, were carefully screened from nearly double the number who applied. During their course they will study engineering drawing, mathematics, and allied subjects. During their training period they are being paid $250 per month by the Division of Highways. Upon completion of the course they will be promoted to the grade of engineering technician with a raise in salary, and assigned to work in one of the ten highway districts.

The purpose of training these 200 young men is to release engineering personnel from routine tasks, thereby permitting engineers to do design and other professional work.

One-hundred-twenty-five men are receiving their instruction on the campus of the University of Illinois at Urbana and are housed in University dormitories. Seventy-five are receiving their training at the Navy Pier Branch of the University in Chicago. The staff at Urbana is headed by Ellis Danner and at Navy Pier by Fred Trezise.

The overall results of this project may mean a whole new conception of the utilization of engineers. With adequate technical help trained to do simple engineering tasks, working in a group of two or three technicians and one engineer, it is conceivable that the output of each engineer could be doubled or tripled.

Geographic Distribution

1. Illinois (Chicago 19.31%) (Downstate 20.60%)	39.9%	6. Indiana	2.6%
2. California	18.5	7. New Jersey	2.6
3. Ohio	6.8	8. Minnesota	2.2
4. Pennsylvania	5.1	9. Washington, D.C.	2.2
5. Michigan	3.0	10. New York	2.2
		All Other (none over 1.29%)	14.9

	Total Grad.		Average	High	Low	Employed	Armed Service	Graduate	Other
All Engineers	352		481.33	675.00	320.00	233–66.2%	22–6.3%	56–15.9%	41–11.6%
Electrical	108	30.7%	490.60	675.00	350.00	82	3	13	10
Mechanical	80	22.7%	481.17	625.00	440.00	59	4	7	10
Civil	50	14.2%	456.78	630.00	320.00	28	7	8	7
Aeronautical	24	6.8%	503.50	563.00	377.00	18	3	1	2
Industrial	23	6.5%	466.21	531.00	440.00	14	2	4	3
Engr. Physics	19	5.4%	463.66	500.00	390.00	6	2	11	....
All other	48	13.7%	484.64	550.00	425.00	31	4	12	6

Television has made a wonderful change in American conversation. There's less of it. — *Louisville Courier-Journal Magazine*

It's always a good idea to keep your words soft and sweet, because you never know when you will have to eat them.—*Nat'l Safety News.*

Typical Structural Examination Questions

B1. Design a spirally reinforced concrete column to carry a 1000K load with a clear height of 20 feet. Design main spiral reinforcement and make a simple sketch showing placement of reinforcement. Assume 3000 psi concrete and intermediate grade reinforcement bars.

B2. Describe term "prestressed concrete." Describe difference between prestressing and post stresing. Give advantages and disadvantages of this type of construction.

B3. Fig. B3 represents one of a series of tee beams for a simple span highway bridge. The maximum moment in the beam at the center line of span due to live load plus impact is 598,000 ft. lbs., and the maximum end shear in the beam due to live load plus impact is 45,800 lbs.

(a) Using ACI Code, 3000# concrete and intermediate grade steel calculate the area of steel required at mid-span and indicate in a cross-section the arrangement and size of bars.

(b) Using same specifications calculate size and spacing of stirrups at ends of beam if stirrups are required.

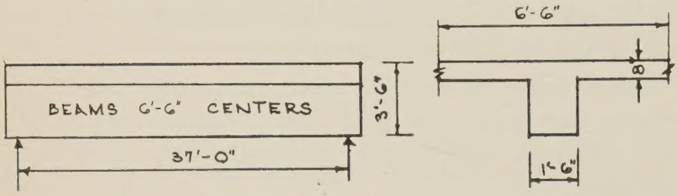

Fig. B-3

B4. Fig. B4 represents a circular column carrying a load of 500 tons.

(a) Design main steel and spiral reinforcement.

(b) Indicate in a sketch the arrangement of the reinforcement in the column. Design in accordance with ACI code for 3000# concrete and intermediate grade steel.

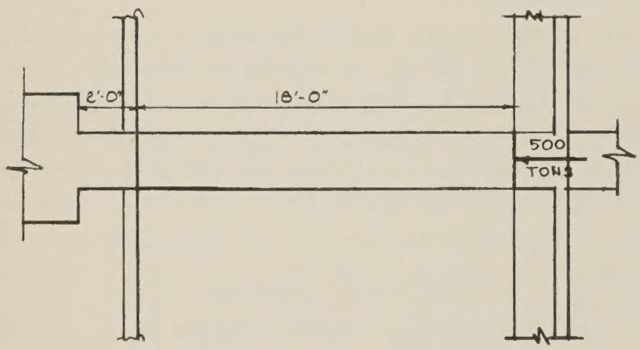

Fig. B-4

B5. (a) What precautions should be taken, tests specified and supervision required in order to secure a high grade concrete job in the swimming pool of Problem B6.

(b) Describe a standard cylinder test and a standard beam test. State when you would require each.

B6. Design the swimming pool wall and footing shown in Fig. B6. Indicate the size and location of the reinforcement. Maximum allowable soil pressure—3500 psf.

B7. Fig. B7 is a typical cross-section through a mezzanine floor in a store building. Design the floor slab, and indicate the reinforcement.

Liveload—75 psf   Ceiling and Floor Finish—25 psf.

B8. Design a rectangular reinforced concrete beam for a 50 ft. span c/c bearings to carry a load of 100K at 15 ft. from the right support and another load of 120K at 35 ft. from the right support. Draw a moment and shear diagram. Prepare a neat sketch showing proposed placement of all reinforcement needed. Assume 3000 psi concrete and intermediate grade reinforcement bars. Use a balanced design. Assume beam laterally supported.

B9. Design a composite beam consisting of a wide flange beam with a concrete slab anchored to the top flange so as to make the composite section act as a T beam, with the following data. Assume lateral support.

Span—80 ft. c/c bearings
Slab—6 inches thick, 6 ft. wide
Liveloads—2 at 16K each 14′ c/c moving
Impact—Assume 22%

Assume no center support during concreting. Permissible fs = 20Ksi, fc = 1350 psi. Calculation of shear connectors not required. Calculate L.L. deflection of composite section using n = 8.

B10. Fig. B10 shows a rectangular beam to carry a uniformly moving load of 5,800 lbs. per ft. on a span of 20 ft. n = 12, v = 0.02 f′c for concrete alone and 0.06 f′c for the reinforced beam. Assume b = 16 in. and d = 25 in. Assume f′c = 2,500 psi. Design and detail vertical stirrups required.

B11. What size spiral column is required to carry a load of 2,400,000 lbs.? Clear height between floors is 12 ft., f′c = 3,750 psi and p = .06. Intermediate grade steel.

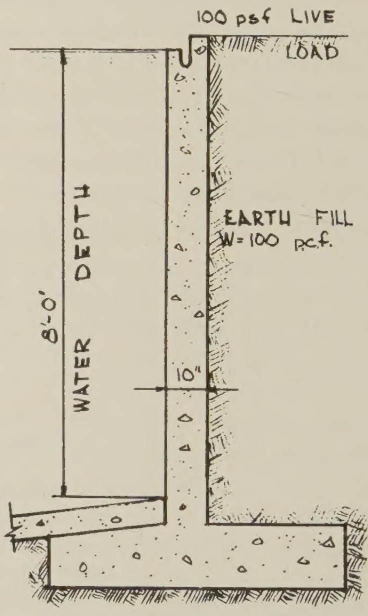

Fig. B-6

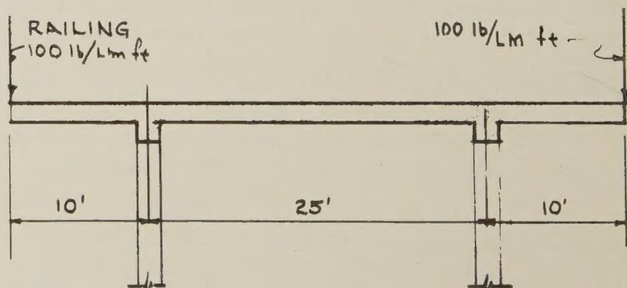

Fig. B-7

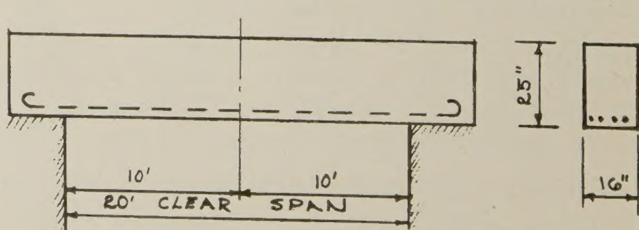

Fig. B-10

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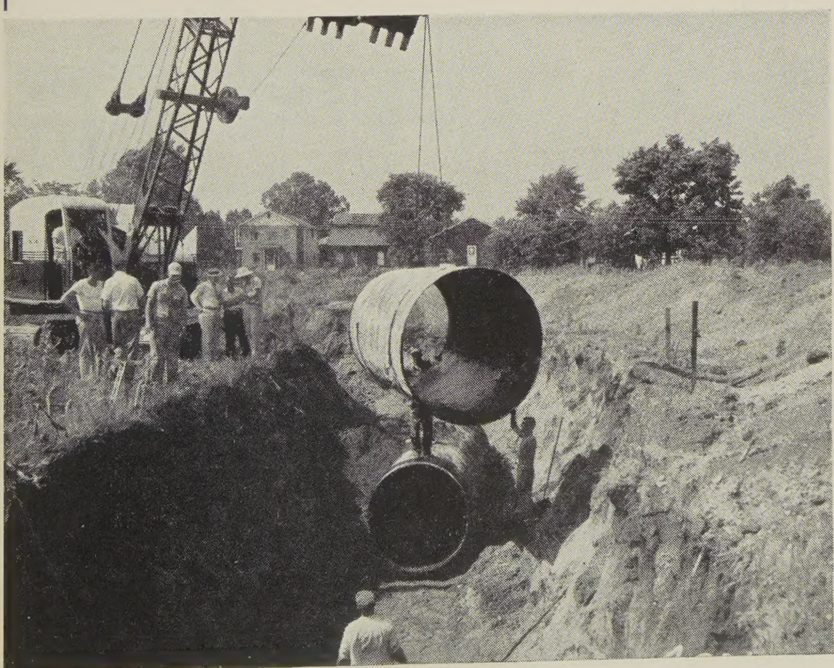

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C1. Indicate on a sketch the number and length of cover plates you would use on the girder shown in Fig. C1. Assume that the specifications under which you are to work do not require that the first cover plate be run the full length of the top and bottom flange.

Solve by assuming the area of the flange material plus ⅛ the area of the web is concentrated at the centroid of the combined sections. Allowable tension 18,000 psi.

C2. (a) Draw a stress diagram for the roof truss and note the stresses in various members in Fig. C2.
(b) Detail joint (X) using ¾" dia. rivets.

C3. Design the crane girder for the moving loads as indicated in Fig. C3. These loads include the allowance for impact. Assume the top flange to be laterally supported so that no reduction in stress on this account is necessary.
(a) Indicate maximum shear.
(b) Indicate maximum moment.
(c) Select the proper section.

C4. Calculate maximum moments and end shear of a steel plate girder with 80 ft. span c/c end bearings, for a moving load as shown in Fig. C4. Assume dead load including girder of 600 lbs. per lineal foot. Assume impact at 25%.

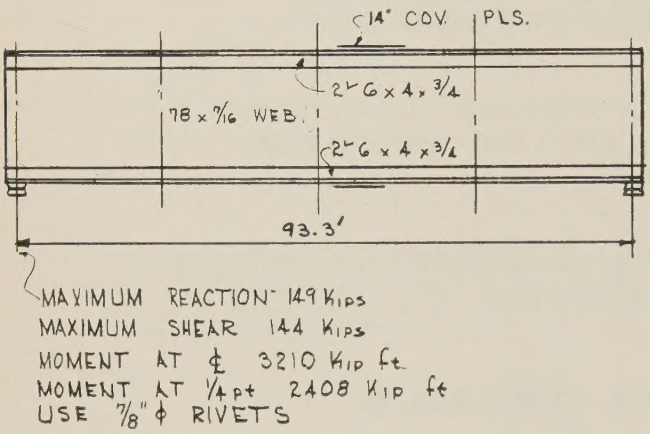

Fig. C-1

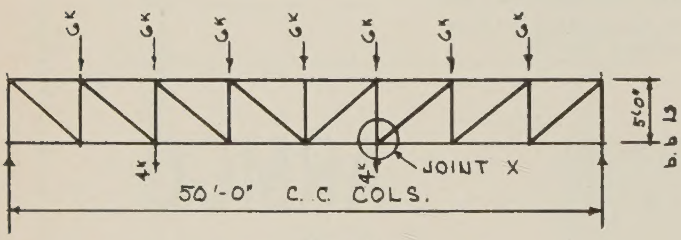

Fig. C-2

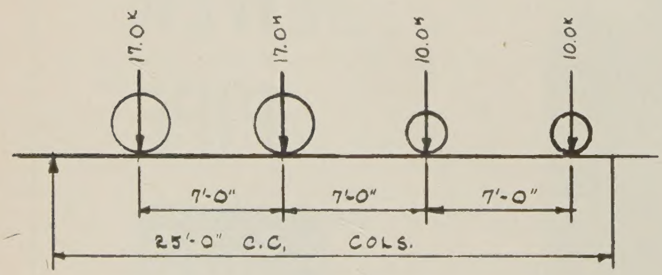

Fig. C-3

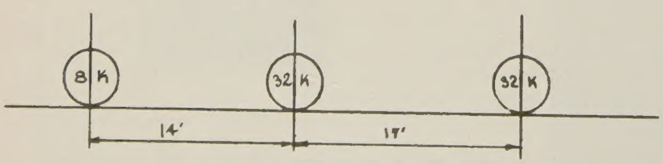

Fig. C-4

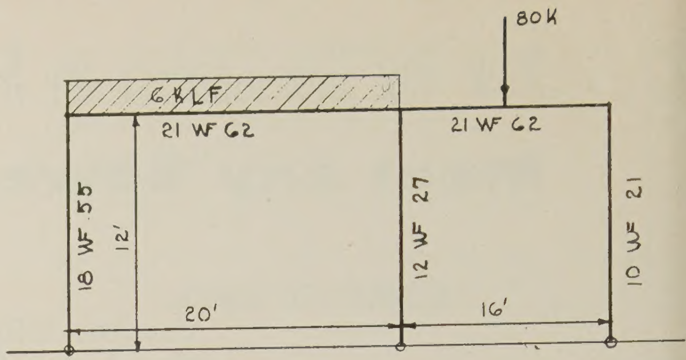

Fig. C-5

C5. In the structure shown in Fig. C5 determine moments at column heads and maximum positive moments in spans using the method of moment distribution (Hardy Cross method) with the loadings shown. Are sections shown adequate? If so show proof. Ignore sidesway.

C7. Assume the following data for design of a steel mill building with corrugated steel roofing and siding:

Length—10 bays at 20'
Width—60'
Trusses—Fink type
30 Ton capacity overhead traveling crane
Crane Truck—2 wheels spaced 10' center to center, 40,000 lb. maximum wheel load
Height—Bottom of truss to floor 20'

Make free-hand sketches showing line diagram plan, cross-section, end elevation and side elevation of building, indicating suggested bracing and purlin spacing.

C8. Make a rough design of crane runway beams.

C9. Indicate in a sketch the rivets required to connect the diagonal truss member shown in Fig. C9 to the gusset plates. Use ⅞" dia. rivets.

C10. What size and length of cover plate is required for the load shown in Fig. C10? Extend plates 18" beyond point of theoretical cut off. What is the shear per lineal inch on each weld (continuous)? Assume top flange of beam is stayed laterally.

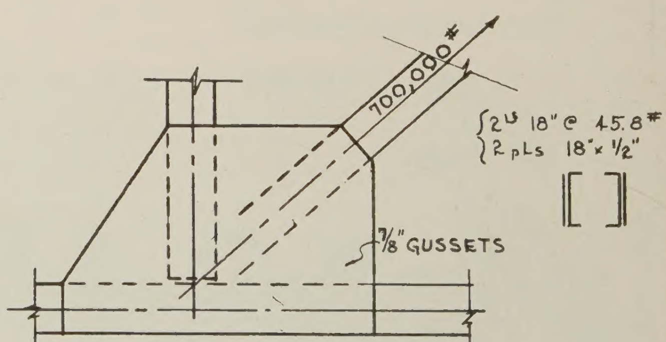

Fig. C-9

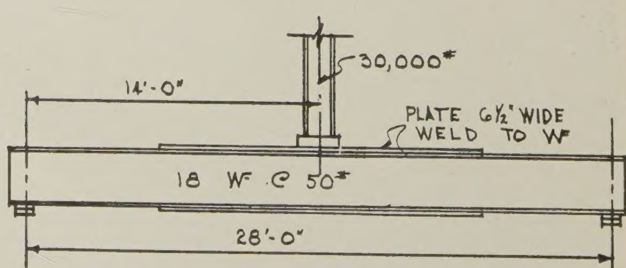

Fig. C-10

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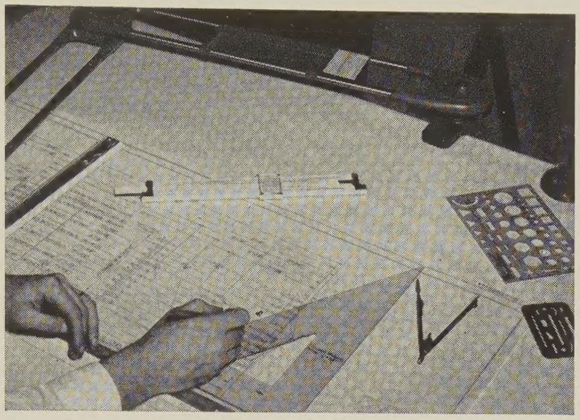

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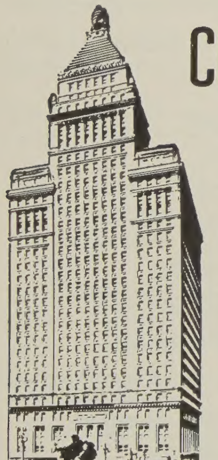

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ASME STUDIES "BIOTECHNICAL" AND OTHER INDUSTRIAL PROBLEMS

Dozens of the toughest problems facing American industry were attacked by thousands of engineers, medical men, business executives and scientists at a meeting in San Francisco June 9-14. Use of nuclear energy without danger to the public, construction of high-speed aircraft that will not be melted by friction with the air, enabling men to withstand the enormous strains of space flight, and cheap atomic energy for civilian use were some of the items considered.

A tightly packed schedule of more than 130 technical papers and panel discussions included sessions on "biotechnology" in which medical experts and researchers from other fields revealed new research results on what happens to humans exposed to extreme heat, cold or radiation such as that encountered in outer space.

Present and future problems of the aviation industry were covered, including improved landing gear, aerial refueling devices, and methods of building aircraft that will not melt as a result of high-speed friction with the air. Particular attention was paid to titanium, a metal coming into wide use at high temperatures.

Preparing for space flight, one technical paper described gyroscopic devices for "inertial navigators" which permit a pilot to determine his course and position without the aid of radio or celestial navigation.

Other topics considered included materials handling in industrial plants, dust and fume control, lubrication, aircraft maintenance, computers, solar energy for practical applications, methods of producing new products from wood and problems of maintaining industrial plants for peak efficiency.

ASME STUDIES TWO AIRCRAFT PROBLEMS

San Francisco, June 10—Solutions to two of the knottiest problems facing aircraft designers, landing gear and aerial refueling units, were suggested at a meeting of engineers here.

A new type of landing gear, developed for heavy Air Force cargo planes with a gross weight close to 100,000 pounds, was outlined by R. O. Dickinson, Jr. of the Lockheed Aircraft Corporation, Marietta, Georgia. Instead of the conventional arrangement, the new device features two wheels, one in front of another, as on a bicycle, on each side of the aircraft. This tandem arrangement, the speaker said, promises several advantages including improved reliability, smaller concentration of weight on the runway and a narrower housing when the wheels are retracted. For military airplanes which may operate from hastily prepared fields with soft surface of dirt or sand, the tandem arrangement permits the second wheel to run in the tightly packed track of the first, thereby reducing friction.

Another paper presented at the same session, part of the semi-annual meeting of the American Society of Mechanical Engineers at the Sheraton-Palace Hotel, described methods used to develop America's most modern aerial refueling devices. The new units are said to permit fighters and bombers to refuel rapidly at higher altitudes and higher speeds than ever before.

Author of the paper is William F. Whitesides, engineering manager of Flight Refueling Inc., of Baltimore, Maryland.

The primary use of aerial refueling today is to increase the range and pay-load capacity of military planes. The newest systems are said to be compact, lightweight, simple and reliable, and to allow a flying tanker to deliver fuel to more than one aircraft at a time, including comparatively small aircraft such as fighters.

Our portly neighbor hasn't gone shopping with his wife for ten years. Recently he demanded to know where all the grocery money was going.

She answered tartly, "Go upstairs and stand sideways in front of the mirror!"—*McCall Spirit*

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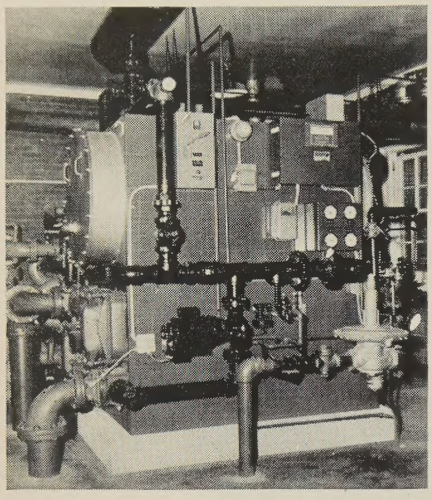

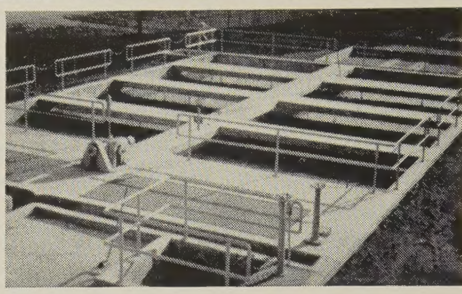

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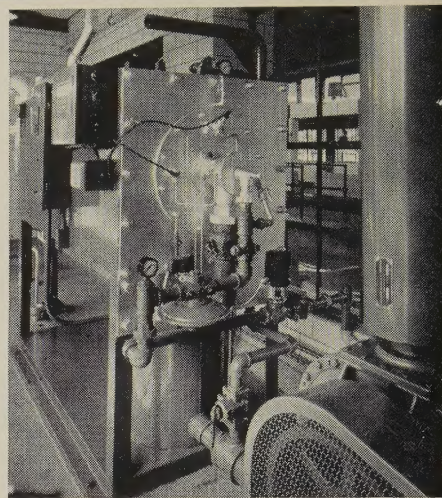

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AWARD TWO $4,000 HIGHWAY ENGINEERING SCHOLARSHIPS

Winners of two 1957 $4,000 highway engineering scholarships, given by Springfield and Peoria, Ill. organizations, were announced recently by Prof. Ellis Danner, professor of highway engineering at the University of Illinois and chairman of the judging committee.

Winners of the two scholarships, which are to the University of Illinois, are Donald W. Neibel, 1401 East Fourth street, West Frankfort, Ill., senior at Frankfort Community High School; and Darrel G. Lohmeier, RR 1, Davis, Ill., senior at Dakota Community Unit 201.

First and second alternate winners named are Carter H. Brantner, 9 Enlow Drive, Decatur, Ill., senior at Decatur High School; and Ward R. Malisch, 609 Robert street, Henry, Ill., senior at Henry-Senachwine High School.

The two $4,000 scholarships, largest of several hundred available to undergraduates at the University of Illinois, are given, one by the membership of the Associated General Contractors of Illinois, 319½ South Sixth street, Springfield, a highway trade association, and the other jointly by two individual contracting member firms of the association, S. J. Groves & Sons Co., Springfield, Ill. and Minneapolis, Minn.; and McDougal-Hartmann Co., Peoria, Ill.

Purpose of the scholarships is to encourage seniors of Illinois high schools to pursue highway engineering as a college career to help overcome the current shortage of engineers. This is the third year for the two $4,000 scholarships.

Eligible to receive the scholarships are male seniors from accredited Illinois high schools qualified to enter the University of Illinois college of engineering. Judging is based on submission of an essay; personal interview by a three-member judging committee; and letters of reference.

With Professor Danner on the judging committee were Prof. Stanley Pierce, associate dean in civil engineering at the U. of I.; and Ralph R. Bartelsmeyer, chief highway engineer, State of Illinois.

The winners were chosen from 12 boys interviewed May 21 at the U. of I. The 12 were selected from a field of 35 final applicants from throughout Illinois.

Both Neibel and Lohmeier will begin their civil engineering studies in September at the University. Each will receive $1,000 annually during the four years at the U. of I.

Should either of the two winners for any reason be unable to use the scholarships, the two alternates will become eligible in respective order.

A young woman was having her dreams analyzed by a psychiatrist. One day she told him she hadn't dreamed the night before. "Young lady," snapped the psychiatrist, "I can't help you if you don't do your homework!"—*Spokes & Spokes*